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THE
SHEPHERD of BANBURY'S
RULES
TO JUDGE OF THE
CHANGES
OF THE
WEATHER,
Grounded on Forty Years Experience.

To which is added,

A RATIONAL ACCOUNT of the Cauſes of ſuch Alterations; the Nature of Wind, Rain, Snow, *&c.* on the Principles of the *Newtonian* Philoſophy.

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BRITISH MUSEUM

INTRODUCTION.

AS we very juſtly eſteem it a fit tribute of admiration to adorn natural curioſities, by ſetting them as richly and as advantageouſly as art can direct, ſo the following obſervations of the ſhepherd of Banbury have appeared to me worthy of being preſented to the eye of the public, with all the luſtre that it was in my power to give them. It is one thing to obſerve, and another to reaſon upon obſervations; and it very rarely happens that both can be taken into the compaſs of one man's life. We ought therefore to conſider it as a very lucky incident, when the obſervations of another man, upon whom we can depend, fall into our hands, and enable us to add natural experience to the notions derived to us from books of philoſophy.

There is a degree of pedantry in deſarts as well as colleges. Men who derive their knowledge entirely from experience, are apt to deſpiſe what they call book-learning; and men of great reading are as apt to fall into a leſs excuſable miſtake, that of taking the knowledge of words for the knowledge of things; whereas there are not any two points more oppoſite in nature, ſince we very rarely ſee, that either true ſcholars are talkative, or that talkative men are true ſcholars.

The ſhepherd, whoſe buſineſs it is to obſerve what has a reference to the flock under his care, who ſpends all his days, and many of his nights, in the open air, and under the wide-ſpread canopy of heaven, is in a manner obliged to take particular notice of the alterations of the weather; and when once he comes to take a pleaſure in making ſuch obſervations, it is amazing how great a progreſs he makes in them, and to how great a certainty at laſt he arrives, by mere dint of comparing ſigns and events, and correcting one remark by another. Every thing in time becomes to him a ſort of weather-gage. The ſun, the moon, the ſtars, the clouds, the winds, the miſts, the trees, the flowers, the herbs, and almoſt every animal with which he is acquainted; all theſe, I ſay, become to ſuch a perſon inſtruments of real knowledge.

There are a ſort of half-wiſe people, who, from the conſideration of the diſtances of things, are apt to treat ſuch prognoſtications, as they phraſe them, with much contempt. They can ſee no connexion between a cat's waſhing her face, and the ſky's being overſpread with clouds; and therefore they boldly pronounce that the one has no relation to the other. Yet the ſame people will readily own, that the fluttering of the flame of a candle is a certain token of wind, which however is not diſcernible by their feeling; becauſe it lies within the compaſs of their underſtanding, to diſcern that this fluctuation of the flame is cauſed by the wind acting upon it, and therefore they are inclined to believe this, tho' it does not fall actually under the cogniſance of their ſenſes. But a man of a larger compaſs of knowledge, who is acquainted with the nature and qualities of the air, and knows what an effect any alterations in the weight, the dryneſs, or the humidity of it has upon all animal bodies, eaſily perceives the reaſon why other animals are much ſooner ſenſible of any alterations that happen in that element than men; and therefore to him, the cawing of ravens, the chattering of ſwallows, and a cat's waſhing her face are not ſuperſtitious ſigns, but natural tokens (like that of the candle's fluttering) of a change of weather; and, as ſuch, they have been thought worthy of notice by Ariſtotle, Virgil, Pliny, and all the wiſeſt and graveſt writers of antiquity.

But ſtill a few ſlight and trivial obſervations of this kind, and ſuch as are in the power of every man to make, go but a very little way in furniſhing us with an uſeful knowledge of the indications of the weather. To ſupply theſe, and to have conſtantly at hand the means of judging of theſe alterations, men of great genius have invented, (and wonderful inventions they are!) inſtruments for meaſuring the heat, the cold, the weight, the dryneſs, and the humidity of the air, with great exactneſs, and upon theſe they reaſon as to the changes of weather with great accuracy and certainty. It would undoubtedly be a great folly to pretend to queſtion either the truth of their obſervations, or the uſefulneſs of them; but then we may have leave to conſider how far, and to how great a degree they are uſeful. The thermometer meaſures exactly the degrees of heat; but the air muſt be hot to ſuch or ſuch a degree, before it is diſcerned by this inſtrument. The barometer indicates the weight of the air; and the riſing and falling of the quick-ſilver expreſſes the alterations in its weight, with wonderful nicety; but then thoſe alterations are the cauſe of this. In like manner, the hygrometer, or hygroſcope, meaſures the dryneſs or humidity of the air very plainly and very exactly; but the weather muſt alter, muſt become dryer or moiſter than it was, before theſe alterations are viſible; and therefore, however ingenious, however curious, however uſeful theſe inſtruments may be in other reſpects, they undoubtedly contribute very little to the prognoſticating a change of weather at a diſtance; and it is from the experience of this, that they are ſo little eſteemed, ſo lightly regarded by the common people.

Our ſhepherd's obſervations are of quite another nature: moſt of them give us a day's notice, many a week's, and ſome extend to ſeveral months prognoſtication of the changes of the weather: and of how great uſe theſe may be to all ranks and degrees of people, to the ſedentary valetudinarian, as well as the active traveller; to the ſportſman who purſues his game, as well as to the induſtrious huſbandman, who conſtantly follows his labour; in ſhort, to every man in every ſituation, in ſome degree or other, is ſo very clear and intelligible, that it would be a mere waſte of words, and a very idle diſplay of rhetoric, to attempt the making it clearer. Every man living would be glad to foreſee the alterations of weather if he could; and conſequently to moſt people, if not to all, theſe obſervations, grounded on no leſs than forty years experience, cannot but be acceptable.

To make the beſt uſe of one's talent, and to employ the lights derived from the ſtation in which providence has placed one, for the benefit of mankind, is undoubtedly diſcharging one's duty, anſwering the end of our creation, and correſponding with the œconomy of nature, which does nothing in vain. This propoſition is equally true, let a man's ſtation be what it will. It is the manner in which we perform, and not the character, that makes the player; and in this ſenſe, what man is not a player? Here then is an inſtance of one, who has for many years ſtudied his part, and now communicates his diſcoveries freely. In a phyſician, in a philoſopher, in a mathematician, this would be highly commendable; and why not in a ſhepherd? We do not caſt our own parts in the drama of life; no, this is performed by the great Author of nature. He who adjuſted every thing on earth with ſuch beauty and harmony; he who taught the heavenly bodies to move, the ſame diſtributed their ſeveral offices to men. May we not therefore ſuppoſe, that every man's part is well caſt, and that our abilities are exactly proportioned to our ſtations? If ſo, he who does all he can, does all that ought to be expected from him, and merits from impartial judges, the moſt general and juſt applauſe. To be convinced of this, we need only reflect on the nar row and ſelfiſh conduct of ſome, who, either by ſtudy or by chance, have acquired certain valuable ſecrets, which, with the utmoſt induſtry, they conceal, in order to be the more admired, or that they may render them beneficial to themſelves. How contrary the conduct of our ſhepherd! his pains were all his own, but the fruit of them he thus generouſly offers to the public. Good ſenſe and the dictates of nature taught him this maxim, "That what might benefit *many*, "ſhould not be concealed by *one*, from views of *profit* "or of *pride*."

In my remarks upon the ſhepherd's rules, I have ſometimes endeavoured to ſupport them by authorities, which I muſt confeſs would have been of little uſe if the author had been a perſon of learning; but when it is conſidered, that theſe obſervations were purely the effect of his own attention and experience, it certainly ſtrengthens them, and adds greatly to their credit, that they have been eſteemed evident ſigns of the ſame effects, by the greateſt maſters in this kind of ſcience. The art of prognoſticating the weather may be conſidered as a kind of decyphering; and in that art it is always allowed a point of great conſequence, when ſeveral maſters therein agree as to the meaning of a character; and it is from thence very juſtly preſumed, that this character is rightly decyphered. I have alſo endeavoured to explain moſt of his obſervations according to the rules of the new philoſophy, which, as it is grounded upon experiments, ſo it, generally ſpeaking, enables us to give a fair and rational account of almoſt all the phænomena taken notice of by the ſhepherd of Banbury. I likewiſe have added ſome other rules in relation to the weather, taken from the common ſayings of our country people, and from old Engliſh books of huſbandry; but I have diſtinguiſhed all theſe from the obſervations themſelves: So that the reader will have no trouble to diſcern the text from the commentary, or to know what belongs to the ſhepherd of Banbury, and what to the editor of his obſervations. This, I think, may ſerve by way of introduction: let us now proceed to the rules themſelves.

THE
COUNTRY KALENDAR,
OR THE
SHEPHERD of BANBURY's
OBSERVATIONS.

I.

SUN. *If the Sun riſe red and fiery*--Wind and rain.

THE reaſon of this appearance is, becauſe the Sun ſhines thro' a large maſs of vapours, which occaſions that red colour that has been always eſteemed a ſign of rain; eſpeially if the face of the ſun appear bigger than it ought: or then in a few hours the clouds will grow black, nd be condenſed into rain; ſudden and ſharp if in the ummer, but ſettled and moderate if in winter.

The old Engliſh rule, publiſhed in our firſt almaacks, agrees exactly with our author's obſervation:

If red the ſun begins his race,
Be ſure that rain will fall apace.

If the reader would ſee this elegantly deſcribed, the aſter of poets hath it thus: *

Above the reſt, the ſun who never lies,
Foretels the change of weather in the ſkies;

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* *Sol* quoque et exoriens, et cum ſe condit in undas,
Signa dabit; *Solem* certiſſima ſigna ſequuntur;
Et quæ mare refert, et quæ ſurgentibus *Aſtris*.
Ille ubi naſcentem *maculis* variaverit ortum
Conditus in nubem, medioque refugerit orbe;
Suſpecti tibi ſint *imbres*. Namque urget ab alto
Arboribuſque ſatiſque notus pecorique ſiniſter.
VIRGIL. *Georgic. lib.* I. V. 438.

For if he riſe unwilling to his race,
Clouds on his brow, and ſpots upon his face;
Or if thro' miſts he ſhoots his ſullen beams,
Frugal of light, in looſe and ſtraggling ſtreams,
Suſpect a drizzling day and ſouthern rain,
Fatal to fruits, and flocks, and promis'd grain.

II. *If cloudy, and it ſoon decreaſe*---Certain fair weather.

I Conceive the reaſon of this to be, that the vapours being then ſpecifically lighter than the air, are ſtill riſing upwards, in which they are aſſiſted by the heat of the ſun-beams; agreeable to the notion of Dr. Derham, who obſerves, that after much cloudy weather it is always fair before it rains, becauſe the watry vapours are not condenſed till they reach the cold upper regions; agreeable to the common Engliſh ſaying,

The evening red and morning grey,
Is a ſign of a fair day.

It is alſo an obſervation of Pliny's, in his natural hiſtory: *

" Si ab ortu ſolis repellentur nubes, et ad occaſum " abibunt, ſerenitatem denunciabunt:" That is,

If at ſun-riſing the clouds are driven away, and retire as it were to the Weſt, this denotes fair weather.

There is an old adage to this purpoſe, which, becauſe it is ſo very prettily expreſſed, deſerves our notice, *viz.*

A red evening and a grey morning ſets the pilgrim a-walking.

In French thus:

Le rouge ſoir, & blanc matin,
Font rejouir le pelerin.

The Italians ſay the ſame:

Sera roſa, & nigro matino,
Allegra il peregrino.

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* Nat. Hiſt. Lib. XVIII. Cap. 35.

III. CLOUDS. *Small and round, like a dapple-grey, with a* North-wind——Fair weather for 2 or 3 days.

THIS is differently expreſſed by other authors. My lord Bacon tells us, that if clouds appear white, and drive to the *N. W.* it is a ſign of ſeveral days fair weather.

Our old Engliſh almanacks have a maxim to this purpoſe:

If woolly fleeces ſpread the heav'nly way,
Be ſure no rain diſturbs the ſummer-day.

And Pliny to the ſame purpoſe*, "Si ſol oriens "cingetur orbe, & poſtea totus defluxerit æqualiter, "ſerenitatem dabit:" That is, If the riſing ſun be encompaſſed with an iris or circle of white clouds, and they equally fly away, this is a ſign of fair weather.

There is another Engliſh proverb worth remembering;

In the decay of the moon,
A cloudy morning bodes a fair afternoon.

IV. *Large like rocks*————Great ſhowers.

IN the old almanacks, we have this ſign of the weather thus expreſſed,

When clouds appear like rocks and towers,
The earth's refreſhed by frequent ſhowers.

The reaſon of this ſeems to be, that the watry vapours are then condenſed or condenſing, which gives them this rough and ragged appearance: and as ſoon as the thin films that retain the water are broke by this preſſure, theſe heavy clouds deſcend in rain.

Theſe obſervations, as well as ſome that follow, are agreeable to all climates, which is the reaſon that they appear in ſo many different authors, and have been taken notice of in ſo many ages. This however does not at all diminiſh the credit, or the merit of our ſhepherd's obſervations, who certainly drew them, not from books, but from his own experience, and therefore their

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* Ut ſupra,

agreeing ſo well with the rules of other great maſte
ought to eſtabliſh his authority: in ſuch caſes as a
not ſupported by a like concurrence from ancient
modern writers, the teſtimony of nature is always ſu
ficient evidence.

V. *If ſmall clouds increaſe*——Much rain.

THIS and the following obſervation cannot well
underſtood, without giving ſome account of clou
in general. The atmoſphere is ſuppoſed to extend i
ſelf about five miles round this globe of earth, an
within that ſpace move all kind of vapours, exhaled b
the ſun's force, or protruded by the ſubterraneous hea
The aſcending of theſe vapours into the air depends
pon many things; and is therefore as different as i
cauſes: for inſtance, their aſcent depends, in the *fir*
place, on the degree of heat with which they are draw
up or forced out; *next*, upon the lightneſs of the va
pours themſelves; *3dly*, on the denſity or rarity of th
air thro' which they paſs; and, *laſtly*, on the forc
and direction of the winds which they encounter i
their paſſage.

According to the nature of theſe vapours, and th
circumſtance attending their paſſage, they appear to u
differently below. For, if they be extremely ſubtil
they mount very high, and there, according to the ſen
timents of Sir Iſaac Newton, form by refraction the a
zure or blue colour that overſpreads the ſky in ſe
rene weather. Clouds, while they remain viſible, d
not riſe above the height of a mile; and we always ob
ſerve, that the higheſt are of a very light colour, an
hardly ſeen. If, therefore, ſmall clouds increaſe,
ſhews, that the diſpoſition of the air is ſuch, as tha
theſe clouds cannot riſe therein, either from their ow
weight, the want of a protruſive force, or from the fa
ling of the wind, which, in cloudy weather, is alway
a ſign of rain.

VI. *If large clouds decreaſe*——Fair weather.

THE ſame kind of reaſoning accounts very clearly for this prognoſtick, ſince it ſhews, that the vapours are either exhaled by the ſun's heat, or are driven off by winds, and ſo reſolved into ſmaller clouds, capable of aſcending higher in the atmoſphere; all which are circumſtances that ſecure us from rain, and afford us a certainty of fair weather.

It is, however, to be obſerved, that large black clouds are frequently, in a ſummer-evening, melted into dews; and this much more frequently happens in the autumn, becauſe the evenings are then cooler, and the vapours more eaſily condenſed for that reaſon. In all obſervations of this ſort, there is a great degree of prudence and good ſenſe required to apply them; and hence it very frequently happens, that ſuch obſervations are condemned as treacherous and abuſive, merely becauſe thoſe who would employ them, want the ſagacity which is requiſite to underſtand them clearly.

VII. MISTS. *If they riſe in low ground and ſoon vaniſh*——Fair weather.

THIS is a ſure ſign, and very well expreſſed, that is clearly and in few words, which is the excellency of ſuch aphoriſms. In order to be convinced of its good ſenſe and certainty, we muſt conſider a little what Miſts are, whence they riſe, and what becomes of them.

Miſts are, ſtrictly ſpeaking, uncompacted exhalations, which, while they fleet near the earth, are ſtiled Miſts, but when they aſcend into the air, are called Clouds. If, therefore, riſing out of low ground, they are driven along the plain, and are ſoon loſt to the ſight, it muſt ariſe from ſome of theſe cauſes: That there is an air abroad ſufficient to divide and reſolve them, or the heat of the ſun has been ſtrong enough to exhale them, that is, to rarify them ſo as to render them lighter than the air thro' which they were to paſs. Which ever way this happens, the maxim remains unimpeached.

VIII. *If they riſe to the Hill-tops*---Rain in a day or two.

WHEN miſts are very heavy in themſelves, and riſe only by the action of that protruſive force exerted by the ſubterranean fire, they can riſe no higher than where the gravitation becomes ſuperior to that protruſive force; for then they deſcend again by their own weight: and this occaſions the appearance, mentioned in the obſervation, of their hanging upon hill-tops, where they are very ſoon condenſed, and fall down in rain.

There was formerly a very idle and ill-grounded diſtinction between moiſt and dry exhalations; whereas, in truth, all exhalations are moiſt, or, in other words, are watry ſteams thrown off by bodies reſpectively dry; and the former diſtinction was invented only to ſolve theſe phænomena of which we have been ſpeaking, that is, the miſt riſing and diſperſing without rain, and the miſt condenſed and reſolved into rain, which, as I have ſhewn, may be much better explained without any ſuch diſtinction.

IX. *A general miſt before the ſun riſes, near the full moon*——Fair weather.

THIS is a general and a very extenſive obſervation, which enables us to judge of the weather for about a fortnight; and there is very great reaſon to believe, that it will very rarely deceive us. In order to convince the reader of this, it will be neceſſary to explain, as far as we are able, the cauſes of this.

Miſts are obſerved to happen when the mercury in a barometer is either very low or very high; they happen, when it is high, after the region of the air has continued calm a good while, and in the mean time a great abundance of vapours and exhalations have been accumulated, making the air dark by their quantity, and the diſorderly diſpoſition of their parts. They happen, when the mercury is low, ſometimes becauſe the rarity of the air renders it unable to ſuſtain the vapours, which therefore deſcend and fall through it.

But none of theſe caſes agree with the obſervation we are now conſidering; and therefore, to form a true judgment of the weather, we muſt diſtinguiſh between them and the caſe which explains the obſervation.

X. *If in the new moon*——Rain in the old.

WHEN exhalations riſe copiouſly from the earth, into the region of the air, and the air itſelf is in a proper diſpoſition, they aſcend to a great height, and continue a long time before they are condenſed; which accounts very clearly and philoſophically for the interval of fair weather between the riſing of theſe miſts and their falling down again in ſhowers. Their aſcending about ſun-riſe, is a proof that the air is thin, but at the ſame time of a force ſufficient to ſuſtain them; ſince, if the miſts were not ſpecifically lighter than the air itſelf, they could not aſcend.

When the moon is at the full, and ſuch exhalations riſe plentifully, the time neceſſary for them to float in the atmoſphere, before they are condenſed into clouds and rain, extends, generally ſpeaking, beyond the period of that moon; and therefore, the obſervation directs us to expect fair weather.

XI. *If in the old*——Rain in the new.

BUT as it is obſerved, not only in this climate, but all the world over, that great changes of weather happen near the change of the moon, it follows, that this is the ſeaſon when theſe exhalations that aſcend ſo plentifully at ſun-riſing are condenſed, and conſequently is the ſeaſon when we ought to expect rain.

If, therefore, the exhalations riſe in the new moon, it is a ſign that the air is in a fit diſpoſition to ſuſtain and ſupport them for a conſiderable time, and therefore, we have reaſon to expect, that they ſhould continue floating till the next regular change of weather, that is, till the old of the moon, or rather till towards the change: and therefore, the obſervation is very cautiouſly and very properly worded, directing us to expect rain *in* the old, and *in* the new, and not *at* the old or new; becauſe it is obſerved that theſe changes of weather happen not exactly at the change of the moon, but a day or two before or after, of which the reader will meet with many examples in Captain Dampier's hiſtory of winds and ſtorms at ſea.

XII. WINDS. *Obſerve, that in eight years time there is as much South-weſt wind, as North-eaſt; and conſequently as many wet years as dry.*

THIS muſt be allowed a very extraordinary aphoriſm from a country ſhepherd; but at the ſame time it is very agreeable to the obſervations of Dr. Hooke, Dr. Derham, Dr. Grew, and other able naturaliſts, who, with unwearied pains and diligence, have calculated the quantity of rain falling in one year, and compared it with what fell in another. Lord Bacon, that honour to our nation, and the age which produced him, informs us, that it was an old opinion, there was a total revolution of the weather once in forty years, and wiſhes it was inquired into. I cannot tell whether this has ever been done or not, but I think there is good reaſon to conclude, that there is a natural balance eſtabliſhed of wet and dry weather, as of light and darkneſs, heat and cold, and other ſuch like variations.

It may not be amiſs to caution the reader againſt a miſtake into which the manner of this rule being ſtated may eaſily lead him ; it is this, that South-weſt winds cauſe rain, and North-eaſt winds, fair weather, which however is not a thing clear or certain by any means. This indeed is true, that South-weſt winds and rain, North-eaſt winds and fair weather, come together, generally ſpeaking : But the queſtion is, which cauſes the other : and a more difficult queſtion cannot eaſily be ſtated, becauſe there ſeems to be facts on both ſides. South-weſt winds ſeldom continue long without rain ; this ſeems to prove the affirmative : but, on the other hand, when in hard weather rain begins to fall, the wind commonly veers to the South-weſt ; this looks as if the rain cauſed the wind.

But, to keep cloſe to the ſhepherd's obſervation. There is one thing ſeems ſtrongly to confirm it, which is this, that in any given place, the quantity of rain, one year with another, is found to be the ſame by experience, according to which the following table has been calculated, for the mean quantity of rain falling one year with another in thoſe places that are mentioned, and on this proportion the other ſeems to be founded.

At	Harlem	24	Inches
	Delft	27	
	Dort	40	
	Middleburg	33	
	Paris	20	
	Lyons	37	
	Rome	20	
	Padua	37½	
	Piſa	34¼	
	Ulm	27	
	Berlin	19½	
In	Lancaſhire	40	
	Eſſex	19½	

XIII. *When the wind turns to North-eaſt, and it continues two days without rain, and does not turn Sout on the third day, nor rain the third day, it is likel to continue North-eaſt for eight or nine days,* all fair *and then to come to the South again.*

IN my opinion, this and the ſubſequent remarks de pend entirely upon obſervations, and may ſerve ra ther to found an hypotheſis, than ſeem to be deduce from one. That the variations of the wind depen on certain cauſes, and may conſequently be reduce to rules, is highly probable; and ſuch obſervations a theſe render it in a manner certain. But to explor theſe cauſes, and to explain them in ſuch a manne as to account for theſe phænomena in a ſatisfacto manner, requires not only great ſagacity, but muc experience, and many years obſervation; which, how ever, conſidering the great benefits that would reſul to mankind from eſtabliſhing ſuch a THEORY, woul be time well beſtowed.

We may, however, eaſily conceive, that a conſta North-eaſt wind muſt be accompanied with fair we ther: for, whatever the cauſes of winds may be, ye on this ſide the equator, a ſtrong and ſettled Nort eaſt always buoys up the clouds, and keeps them ſu pended. This has been long obſerved by, and pa ſes for a ſettled point amongſt ſeamen. The reaſo of it however cannot be ſo eaſily aſſigned, at leaſt ſatisfactory reaſon; for, as to ſuppoſitions, every fa ciful man can furniſh them at pleaſure.

This, as well as the following obſervations, ve plainly and clearly prove, that, in this part of th world, fair weather attends one wind, and wet, an ther; but which is the cauſe, and which is the effe or whether both are not the effects of ſome oth cauſe, I pretend not abſolutely to determine. But i aſmuch as it is certainly known, that rains attend, other climates, thoſe winds that are here attended wi fair weather, it ſeems more agreeable to ſuppoſe, that rainy weather is occaſioned chiefly by Weſt-winds, becauſe loaded with moiſt vapours from the ſea.

XIV. *If it turn again out of the South to the North-eaſt with rain, and continues in the North-eaſt two days without rain, and neither turns South nor rains the third day,* it is like to continue North-eaſt for two or three months.

The wind will finiſh theſe turns in three weeks.

THIS obſervation is of the ſame nature with the former, and is plainly deduced from long experience. Our author ſeems to contradict himſelf in ſaying, that theſe winds finiſh their turns in three weeks; but his true meaning certainly is, that they are about three weeks in turning from the South to the North-eaſt again. Some very great men have laid it down as a thing certain, that the variations of the wind are to be accounted for by the alteration of the balance of the air, occaſioned by the different effects of heat and cold; but other writers again inſiſt very copiouſly on the effects which winds have upon the air, and thus confound us in a circle of cauſes and effects; whence it is plain, that they do not thoroughly underſtand the ſubject themſelves, and therefore it is no wonder that they are not able to explain it to others.

In ſome parts of the world, and eſpecially between the tropicks, the winds are regular: and therefore our philoſophers ſeem to talk more rationally about them. But, in our Northern countries, the alterations of the wind are ſo frequent, ſudden, and often ſo little agreeable to the ſeaſon, that ſuch general reaſonings will by no means ſerve to explain them. It is however very reaſonable to ſuppoſe, that the ſame general cauſe prevails here as between the tropicks, but with leſs certainty; becauſe the power of the ſun is not ſo great, and the determination of the winds depends on the ſituation of mountains, rocks and woods, which direct the air driving againſt them into certain courſes; ſo that it is impoſſible to explain, or indeed to judge of the courſe of the winds, till the country is thoroughly known, and all thoſe eminences that can affect the winds are well conſidered.

From theſe reflexions the value of our ſhepherd's obſervations will clearly appear. He was not philoſopher enough to talk in this ſtile, but, by a long and ſteady attention, he came to know experimentally, what perhaps few philoſophers, with all their ſagacity, would have been able to have found out.

XV. S. W. WINDS. *After a northerly wind for the moſt part two months or more, and then coming South, there are uſually* three or four fair days at firſt, and then on the fourth or fifth day comes rain, *or elſe the wind turns North again*, and continues dry.

THIS is likeways a very judicious and a very uſeful obſervation, and yet it is not a difficult matter to account for it. It is a common obſervation, and a very true one, that there is uſually fair weather before a ſettled courſe of rain. The winds that bring the dark rainy clouds that obſcure the ſky, and cauſe dull cloudy weather, often raiſe theſe vapours to ſuch a height, that they are attracted into the cold region above our ſight, till being condenſed there, they fall down upon us again in ſnow or rain, according to our author's obſervation.

But if, after a ſeeming tendency to rain, there follow ſeveral days of fine weather, it is a certain indication that the temper of the air is altered, and that theſe vapours had been driven off before they had time to condenſe, which is confirmed by the change of the wind on ſuch occaſions.

All theſe obſervations are to be underſtood in a proper latitude, and not ſtrictly and according to the very letter: For rain may fall the ſixth or ſeventh day, or the wind may change the ſecond or third. Beſides, a man who would make uſe of theſe obſervations in the country, muſt conſider attentively the ſituation of the place where he lives, the bearing of the ſea, marſhes, ponds, lakes, woods, mountains, rocks, &c. For without making proper allowances for theſe, all ſuch obſervations on the weather will be apt to fail him.

XVI. *If it returns to the South within a day or two without rain, and Northward with rain, and return to the South in one or two days, as before, two or three times together after this ſort,* then it is like to be in the South or South-weſt two or three months together, *as it was in the North before.*

The winds will finiſh theſe turns in a fortnight.

THIS may appear a little perplexed to an ordinary reader, but a little attention will make it very clear and plain; and whoever conſiders what mighty uſes may be made of the foreſight of weather for a month or two, will not think this labour ill beſtowed. I muſt confeſs I look upon theſe three rules, in relation to the wind, as the moſt uſeful in the whole collection; eſpecially to farmers and country people, to whom they are of the greateſt conſequence.

But it is a common thing for ſuch people to ſay, What certainty is there that theſe rules will prove true? What probability is there that the wind ſhould continue ſo long in one quarter, and then ſo long in another? How ſhall we be ſatisfied that there is any truth in this? Or, if we cannot be ſatisfied as to the truth of it, why ſhould we depend upon any ſuch-like obſervations?

To this I anſwer, That they may have reaſonabl ſatisfaction given them on this head. Some of ou great naturaliſts, who had kept journals of the weathe for many years, have found that the ſame wind blow every year very near the ſame number of days, an that there is a regular continuance of different wind annually in every country. For inſtance,

At Utrecht they blow thus,

The North wind	42	Days
The N. W.	33	
The Weſt	77	
The S. W.	58	
The South	33	
The S. E.	26	
The Eaſt	53	
The N. E.	43	
	365	

It is a thing plain to every capacity, that a journa or diary of the winds may be kept any where; and i from ſuch a journal, it appears, that a given wind blow for a certain number of days, then it follows that i theſe can be determined with certainty, the time of thei blowing may alſo be determined, at leaſt with grea probability; which is as ſatisfactory an anſwer as ca be juſtly expected; becauſe it ſhews that there is a ju and rational ground for confiding in ſuch obſervation when confirmed by long experience.

XVII. *Fair weather for a week with a ſouthern wind is like to* produce *a* great drought, *if there has been much rain out of the South before. The wind uſually turns from North to South, with a quiet wind without rain, but returns to the North with a ſtrong wind and rain: the ſtrongeſt winds are when it turns from South, to North by Weſt.*

N. B. *When the North wind firſt clears the air, (which* *uſually once a week) be ſure of* a fair *day or two.*

OBSERVATIONS of this nature upon winds have employed the ableſt heads in all ages. Pliny, the reat naturaliſt, has left us a great deal upon this ſub- ect, which plainly proves, that it has been the opini- n of the ableſt and wiſeſt men, that ſtudy, and expe- ience might reduce even things of ſuch ſeeming uncer- ainty under ſtated rules, and within the bounds of a egular ſyſtem: For inſtance he tells us,

"In Africa the ſouth wind is ſerene, the north-eaſt cloudy. All the winds have their turns. To judge rationally of their changes, the fourth day of the moon is to be regarded.---The ſouth wind blows ſtronger than the north-eaſt, becauſe the former riſes from the bottom, whereas the latter comes from the ſurface of the ſea. It is for this reaſon that thoſe earthquakes are moſt dangerous that follow after a ſouth wind."

In order to underſtand this notion of Pliny, we need ly advert to the account given us by the reverend r. Robinſon in his natural hiſtory of Weſtmoreland, hich is exceedingly curious, and well worthy of the ader's peruſal. This ingenious gentleman is of opi- on, that winds have their original from the ſea; of hich he gives the following very probable account:

"It," that is, the wind, "proceeds from vaſt ſwarms of nitrous particles ariſing from the bottom of the ſea, which is put into motion either by the cen-

“ tral fire, or by the heat and fermentation which a
“ bounds in this great body of the earth; and there
“ fore the firſt commotion excited by the ſaid fermen
“ tation we call a Bottom-wind, which is preſentl
“ diſcovered by porpoiſes and other ſea-fiſh, which de
“ light in ſporting and playing upon the waves of th
“ ſea, and by their playing give the mariners the fir
“ notice of an approaching ſtorm.”

“ When theſe nitrous ſwarms are riſen towards th
“ ſurface of the ſea in a dark night, they cauſe ſuch
“ ſhining light upon the waves as if the ſea was o
“ fire. And being delivered from the brackiſh wate
“ and received into the open air, thoſe fiery and ſhi
“ ing meteors which fix upon the maſts and ſides o
“ the ſhips, are only nitrous particles condenſed b
“ the circumambient cold, and, like that which th
“ chymiſts call Phoſphorus, or artificial glow-worm
“ ſhine and caſt a light, but have no heat: This give
“ the mariners the ſecond notice that the ſtorm is ri
“ ſing; for, upon the firſt breaking out of the win
“ the ſea begins to be rough, and the waves ſwell an
“ riſe, when at the ſame time the air is calm an
“ clear.”

“ This boiling fermentation of the ſea cauſes th
“ vapours to riſe, which, by the intenſeneſs of the ci
“ cumabient cold, are condenſed into thick cloud
“ and fall down in ſtorms of wind and rain, firſt upo
“ the ſea from whence they aroſe; and then the a
“ tractive power of the mountain-cold, by a ſecr
“ magnetiſm between vapour and cold, attracts th
“ wateriſh vapours, intermixt with nitrous particles,
“ the high tops of mountains and hills, where th
“ hang hovering in thick fogs, and wateriſh miſts, u
“ til the atmoſpherical heat rarifies the nitrous part
“ the fog, (which is always uppermoſt, and appe
“ white and tranſlucent) into briſk gales of wind, a
“ the intenſeneſs of atmoſpherical cold having attra

"ed the vapours into the colder regions of the air, "where being condenſed into clouds, the wind breaks, "diſſipates and drives them before it, till they fall "down in rain, and water the ſurface of the earth. "And this ſeems to be the reaſon why in Egypt, and "thoſe level countries where they have no mountains, "they have little wind, and leſs rain."

XVIII. CLOUDS. *In ſummer or harveſt, when the wind has been South two or three days, and it grows very hot, and you ſee clouds riſe with great white tops like towers, as if one were upon the top of another, and joined together with black on the nether ſide*, there will be thunder and rain ſuddenly.

WE may very eaſily account for this obſervation; becauſe, in fact, the ſigns here mentioned are no other than nature's apparatus for a ſtorm of thunder and lightning, which will be perfectly underſtood, by attending a little to the cauſes of theſe meteors. Lightning is a great flame, very bright, extending every way to a great diſtance, ſuddenly darting upwards, there ending, ſo that it is only momentaneous. The matter which produces the fire, is the oil of plants attenuated by the heat of the day, and raiſed on high. Then whatever has exhaled from the earth that is ſulphureous or oily, which is diſperſed up and down the atmoſphere, and is not continuous, is ſet on fire by turns, and the flame dilates itſelf as far as the tract of that exhalation reaches. Some other ſubſtance, pendent and floating in the air, meets with this alſo, with which it excites an effervеſcence, takes fire and flaſhes along with it. Thunder is another bright flame, riſing on a ſudden, moving with great violence, and with a very rapid velocity through the air, according to any determination, upwards from the earth horizontally, obliquely, downwards in a right line, or in ſeveral right lines, as it were in ſerpentine tracts joined at various angles, and commonly ending with a loud noiſe or rattling.

It is obſerved, that it thunders moſt when the wind blows from the South, and leaſt when it blows from the Eaſt. The great principle of thunder is ſulphur, as is evident from the ſmell it leaves behind it; but, in order to occaſion ſuch an exploſion, there muſt be other ingredients mixed therewith, eſpecially nitre, of which the air is always full; beſides other things of which it is impoſſible to give any account. The tracts of this ſort of matter fly about in the air, and are as it were lines of gun-powder; and as, in the firing of that powder, the fire begins at one end, and purſuing its aliment proceeds to the other extremity, and ſo the whole maſs of powder is fired, we may from thence account for the phænomenon of thunder. For, in like manner, thoſe inflamed tracts which are ſuſpended in the air, flaſh from a flame that runs from one extreme to the other, wherever the vein of nouriſhment leads it: Hence thoſe rays of thunder, which ſeem to be brandiſhed through the air, and ſometimes to be ſplit in two or more tracts, and ſometimes to return back at other times; to be projected in lines that are joined by various angles; and this only becauſe the flame meets with tracts lying in various ſituations that cohere one with another. Therefore thunder ſeems now to run horizontally, now from above downwards, now upwards from the earth; for, if the matter of thunder preſſing out of the earth is enflamed near the ground, the flame darting upwards, the thunder will ſeem to be projected out of the earth. If the ſame tract be ſet on fire at its upper end, the flame will move downwards, and the thunder will ſeem to deſcend out of the ſky.

Hence we eaſily underſtand, how it comes to thunder oftner in one place than another; but moſt frequently in thoſe where the ſoil produces odoriferous herbs and abounds with ſulphur, and where the people are much expoſed to the extreme heat of the ſun. Thunder is leſs frequent in places where there are few odoriferous herbs, very little ſulphur, or where the climate is watry and moiſt. For inſtance, it thunders very much in Italy and Sicily, and very rarely in Egypt and the adjacent countries. If it be demanded, how it comes to thunder in the midſt of the ocean? The anſwer is eaſy, Becauſe, from the bottom of the ocean, vaſt tracts of ſulphureous matter are caſt up through the waters; as it happens to ſpring-waters in ſeveral places, the ſtreams of which will take fire from a lighted candle. For ſulphureous exhalations burſting out together with the waters, the fulmineous matter in the air is ſet on fire when it meets with exhalations or vapours, with which it can exhibite a vehement effervescence. It is very clear from this account, that the clouds mentioned towards the head of the 17th page, are thunder-clouds, or clouds big with the materials of thunder.

XIX. *If two ſuch clouds ariſe, one on either hand,* it is time to make haſte to ſhelter.

AS this obſervation is of the ſame nature with the former, we ſhall continue our remarks. The reaſon why it ſeldom thunders in winter is, becauſe the exterior parts of the earth are ſo contracted by the cold, ſnow, and ice, that ſulphur cannot perſpire in any great quantities; but as ſoon as the earth begins to be opened by the ſun in the ſpring, ſomething tranſpires in the month of April which takes fire. But, by the greater heat of the ſun penetrating deeper into the earth, the cortex is more opened in May; and now there is a more copious perſpiration of the fulminating matter, and whatever was collected and ſhut up in winter, is now releaſed and ſnatched up in the air: and thence proceeds the moſt frequent thunders in the month of May, and chiefly, when a very hot day or two has gone before. A leſs quantity of the ſame matter remains in the upper cortex of the earth for the month of June; but, in the mean time, a ſtock ariſes out of the deeper bowels of the earth, which is attenuated and prepared, ſo that, by the very fervent heat of July, it is elevated, as it were in heaps, and ſet on fire. Hence thunder is as frequent in July as in May. And the heat decreaſing in the ſucceeding months, the exhalation of the fulminating matter out of the earth is more ſparing; and thence alſo the thunder is leſs frequent, till, in October and the other winter months, the earth is bound up with us, and hardly perſpires any more. Hence we ſee, why it very ſeldom thunders when the northerly winds blow; for theſe winds conſtringe the earth with their cold, and ſo hinder the fulminating matter from burſting forth; and when they are burſt forth and floating in the air, they hinder their effervеſcency. But, on the contrary, when the warm and moiſt South wind blows, which opens every thing, the earth likeways is opened, and abundance of fulminating matter perſpires and aſcends on high, which is there eaſily enflamed.

As the flame runs very ſwiftly, it ſeems to carry along with it particles which it could not ſo eaſily ſet on fire; and when any of theſe particles are drawn together, and heated to a certain degree, they at laſt take fire with a ſudden and great exploſion, and thereby produce what we call a thunder-clap. Now tho' this be only a ſingle ſound, yet it is often heard in the form of a great murmuring noiſe of a long continuance; ſometimes for thirty or forty ſeconds, becauſe of its various repercuſſions by the clouds and terreſtrial obſtacles. Hence it is, that in vales which are ſurrounded by mountains of a different height, there is a terrible and long continued bellowing of thunder-claps;

whereas, for one exploſion, it has been obſerved, that there is but one clap: Yet however, if the flame ſet fire to two, three, or more fulmineous tracts, each of them at laſt will end in a clap, and thus ſeveral ſounds may be heard together, or quickly ſucceeding one another.

XX. *If you ſee a cloud riſe againſt the wind, or ſide wind, when that cloud comes up to you, the wind will blow the ſame way that the cloud came. And the ſame rule holds of a clear place, when all the ſky is equally thick, except one clear edge.*

THIS ſeems to ariſe from hence, that wind being nothing more than air in motion, the effects of it firſt diſcover themſelves above, and actually drive ſuch clouds before them. This was long ago obſerved by Pliny: When clouds, ſays he, float about in a ſerene ſky, from whatever quarter they come you may expect winds. If they are collected together in one place, they will be diſperſed by the approach of the ſun. If theſe clouds come from the North-eaſt they denote winds; if from the South, great rains. But let them come from what quarter they will, if you ſee them driving thus about ſun-ſet, they are ſure ſigns of an approaching tempeſt.

If the clouds look duſky, or of a tarniſhed ſilver colour, and move very ſlowly, it is a ſign of hail. But, to ſpeak more plainly, thoſe very clouds are laden with hail, which, if there be a mixture of blue in the clouds, will be ſmall; but if very yellow, large. Small ſcattering clouds that fly very high, eſpecially from the South-weſt, denote whirl-winds. The ſhooting of fallen ſtars through them is a ſign of thunder. We meet with many obſervations of this ſort in our old writers on huſbandry; and we have abundance of proverbs relating to this ſubject, which are worth obſerving; and the rather becauſe the moſt of them are not peculiar to our language only, but common to us with many of our neighbours. It is the remark of Lord Bacon, and a very judicious remark too, that proverbs are the philoſophy of the common people, that is to ſay, they are trite remarks founded in truth, and fitted for memory. I muſt confeſs that there are ſome of them that ſeem either falſe, or of no great conſequence; but then I am apt to ſuſpect, that, by various accidents, we have loſt their true meaning, or elſe that, in length of time, they have been altered and corrupted, till they have little or no meaning at all.

I cannot help taking notice, in regard to the rule before us, of what captain Dampier tells us, that in the Eaſt Indies they have always notice of a tuffoon, by the skies being firſt clear and calm, and then a ſmall white cloud hanging preciſely in the point from whence the ſtorm comes, where he obſerves, that it remains ſometimes twelve hours or more; and adds, that as ſoon as it begins to move, the wind preſently follows it. When Sir John Bury, who died an Engliſh admiral, had the command of a ſmall frigate in the Weſt Indies, he eſcaped a hurricane in the Leeward iſlands, by taking the advice of a poor negro, who ſhewed him a ſmall white cloud at a diſtance, and aſſured him, that, when it came to the Zenith, the hurricane would infallibly begin, as indeed it did.

XXI. *Sudden rains never* laſt long: *But when the air grows thick by degrees, and the ſun, moon and ſtars ſhine dimmer and dimmer, then it is like* to rain ſix hours uſually.

RAIN is, properly ſpeaking, a multitude of ſmall watry drops, falling from the upper air at different ſeaſons. When the upper regions become cold of a ſudden, the watry clouds are condenſed and fall in haſty ſhowers. It is obſerved, that mountainous countries have moſt rain; and the reaſon ſeems to be the winds driving the clouds againſt the rocks and hills, and thereby compreſſing them in ſuch a manner, that they are immediately diſſolved, and fall, as it were, at once. This is the reaſon, that in Lancaſhire there falls twice as much rain as in Eſſex; and it is probably from the ſame cauſe, that, in the ocean, over againſt the mountainous coaſt of Guiney, ſhowers ſometimes fall as it were by pail-fulls.

This obſervation of our ſhepherd is very juſt and reaſonable, and I dare ſay will hardly ever fail ſuch as obſerve it. The dimneſs of the ſtars and other heavenly bodies, is one of the ſureſt ſigns of very rainy weather. It is likewiſe to be obſerved, that when the ſtars look bigger than uſual, and are pale and dull, and without rays, this undoubtedly indicates, that the clouds are condenſing into rain, which will very ſoon fall; and it has been obſerved, that when the air grows thick by degrees, and the light of the ſun leſſens ſo as not to be diſcerned at all, and again when the moon or ſtars have the ſame appearances, a continued rain for at leaſt ſix hours is ſure to follow.

To be the better informed in ſuch caſes, it is beſt to have recourſe to a variety of ſigns; for it is not only the clouds and ſky, or the ſun, moon and ſtars, that give us previous notice of rainy weather, but almoſt every thing in the creation, and vegetables particularly: As for inſtance, the Pimpernel, which is a very common flower, ſhuts itſelf up extremely cloſe againſt rainy weather. In like manner, the Trefoil ſwells in the ſtalk againſt rain, ſo that it ſtands up very ſtiff, but the leaves droop and hang down. Even the moſt ſolid bodies are affected by this change of the atmoſphere; for ſtônes ſeem to ſweat, and wood ſwells, the air driving the moiſt particles, with which it is filled, into the pores of dry wood eſpecially, making it ſwell prodigiouſly; and this is the reaſon the doors and windows are hard to ſhut in rainy weather.

This is ſo true, that there has been a method found of dividing mill-ſtones by the mere force of the air, which is done in this manner. They divide a block of this kind of ſtone, as big as a large rolling-ſtone, into as many parts as they deſign to make mill-ſtones, and, in the circles where this block is to be divided, they pierce ſeveral holes, which they fill with Sallow-wood dried in an oven, and expoſe the ſtone to the air in moiſt weather, when the wood ſwells to ſuch a degree as to ſplit the ſtone as effectually as if it was done by iron wedges driven by Sledge-hammers. This curious and extraordinary method of dividing mill-ſtones is related by the famous Mr. Ozanam, of his own knowledge.

XXII. *If it begin to rain from the South, with a high wind for two or three hours, and the wind falls, but the rain continues,* it is like to rain twelve hours or more; and does uſually rain till a ſtrong North-wind clears the air. *Theſe long rains ſeldom hold above twelve hours, or happen above* once a year.

THIS depends entirely upon obſervation; and experience ſhews us, that whenever the wind falls, rain follows. It has been likewiſe obſerved, that when the wind changes often, there fall heavy rains. All theſe alterations in the atmoſphere are leſs obſerved by men, than by animals, for two reaſons. The firſt is, that we live much within doors, by which they are leſs obvious to us; and it is for this reaſon, that the huſbandmen, ſeamen, fiſhermen, but above all, ſhepherds, who are more in the open air than other men, are better acquainted with, and more able to diſtinguiſh and judge of the ſigns of the alterations of the weather, than thoſe who live altogether within doors, or go ou but ſeldom. Another reaſon is, our having ſo many things to mind, which takes off our thoughts, and renders us leſs attentive to the ſignals which would give us notice of ſuch alterations. It is for this reaſon that we ought to ſerve ourſelves of that ſort of inſtinct which nature has given to other animals, and which, as it is a gift of nature, is in a manner infallible.

Thus, if ſmall birds prune themſelves, and duck, and make a ſhew of waſhing; if crows make a great noiſe in the evening; if geeſe gaggle more than uſual, theſe are all ſigns of rain; becauſe theſe animals love wet weather, and rejoice at the approach of it. On the other hand, if oxen lie on their right ſides, look towards the ſouth, and lick their hoofs; if cows look up in the air, and ſnuff it; if aſſes bray violently; and if cocks crow at unuſual hours, but eſpecially when a hen and chickens croud into the houſe, theſe are ſure ſigns of rain.

Inſects alſo are very ſenſible of ſuch changes of weather: Frogs croak more than ordinary, worms creep out of the ground, moles throw up more earth than uſual, becauſe ſuch weather is more agreeable to them. Hornets, waſps and gnats, ſting more frequently againſt wet weather than in fair. Spiders are reſtleſs and uneaſy, and frequently drop from the wall, the humid air getting into their webs and making them heavy. But the ſureſt and moſt certain ſign is taken from bees, which are more incommoded by rain than almoſt any other creatures; and therefore, as ſoon as the air begins to grow heavy, and the vapours to condenſe, they will not fly from their hives, but either remain in them all day, or elſe fly but to a ſmall diſtance.

XXIII. *If it begins to rain an hour or two before ſun-riſing, it is like to be* fair before noon, and ſo continue that day; *but if the rain begin an hour or two after ſun-riſing, it is like* to rain all that day, *except the rain-bow be ſeen before it rains.*

THIS is a ſhort, clear and eaſy obſervation, and therefore I ſhall not dwell long upon it, but rather entertain the reader with a few obſervations on the rain-bow. Whenever it appears, things are thus circumſtanced: The Spectator has the ſun behind him, and clouds with the bow in them before him. Sometimes there are two and even three bows ſeen, but this is very rare. The colours in the bow are ranged in this order, *viz.* violet, purple, blue, green, yellow, orange, red. After a long drought, the bow is a certain ſign of rain; after much wet, of fair weather. If the green be large and bright, it is a ſign of rain; but if the red be the ſtrongeſt colour, then it denotes wind and rain together. If the bow breaks up all at once, there will follow ſerene and ſettled weather. If the bow be ſeen in the morning, ſmall rain will follow; if at noon, ſettled and heavy rains; if at night, fair weather. The appearance of two or three rain-bows ſhews fair weather for the preſent, but ſettled and heavy rains in two or three days time.

Lunar rain-bows are ſometimes, but very ſeldom ſeen; they are extremely beautiful, but much leſs than thoſe that appear in the day-time, and a yellow, or rather a ſtraw-colour, prevails moſt. As they happen ſo ſeldom, they cannot well be reckoned amongſt the ſigns of weather. But now, after ſpeaking of ſo many different methods of judging when rainy weather will be of a ſhort or long continuance, give me leave to deſcribe two or three inſtruments, eaſily made, which will ſhew the alterations of the weather certainly, conſtantly, and early enough for moſt uſes.

There were, ſome years ago, a ſort of toys ſold, with a man and a woman ſo fixt before the door of a houſe, that, at the approach of wet weather, the woman entered it, and when the weather grew fair the man: This was done by the help of a bit of cat-gut, which ſhrinks in wet weather, and ſtretches again when it is fair. This appears better by a line and plummet; eſpecially if the line be made of good whip-cord, that is well dried; for then if it be hung againſt a wainſcot, and a line drawn under it exactly where the plummet reaches, in very moderate weather, it will be found to riſe above it before rain, and to ſink below when the weather is like to become fair. But the beſt inſtrument of all is a good pair of ſcales, in one of which let there be a braſs weight of a pound, and in the other a pound of ſalt, or of ſaltpetre well dried, a ſtand being placed under the ſcale, ſo as to hinder its falling too low; when it is inclined to rain, the ſalt will ſwell and ſink the ſcale; when the weather is growing fair, the braſs weight will regain its aſcendancy.

XXIV. SPRING and SUMMER. *If the laſt eighteen days of* February, *and ten days of* March, *be for the moſt part rainy, then the* ſpring *and* ſummer *quarters are like to be ſo too: And I never knew* a great drought, *but it entered* in that ſeaſon.

IT is eaſy to diſcover by obſervation whether this rule be well or ill founded, that is to ſay, whether our ſhepherd's obſervation will ſerve for other places or not, and where it will ſerve and where not. But it may not be amiſs to remark, that it is highly probable, or rather abſolutely certain, that the weather in one ſeaſon of the year determines the weather in another: For inſtance, if there be a rainy winter, then the autumn will be dry; if a dry ſpring, then a rainy winter. Our fore-fathers had abundance of odd ſayings upon this ſubject, and ſome proverbs for every month in the year; but I doubt they were indifferently founded; however, there can be no harm in obſerving them, in order to diſcover whether there be any thing in them or not.

Janiver freeze the pot by the fire.
If the graſs grow in Janiveer,
It grows the worſe for't all the year.
The Welchman had rather ſee his dam on the Beir,
Than to ſee a fair Februeer.
March wind and May ſun
Makes clothes white and maids dun.
When April blows his horn,
'Tis good both for hay and corn.
An April flood
Carries away the frog and her brood.
A cold May and a windy
Makes a full barn and a fendy.
A May flood never did good.
A ſwarm of bees in May
Is worth a load of hay:
But a ſwarm in July
Is not worth a fly, &c.

XXV. WINTER. *If the latter end of* October *and beginning of* November *be for the moſt part warm and rainy, then* January *and* February are like to be froſty and cold, *except after a very dry ſummer.*

IT is very evident, ſuppoſing this obſervation to be true, as I am pretty confident it is, that the reaſon of it is to be ſought in that balance of the weather which providence has eſtabliſhed. There is not only a time to ſow, and a time to reap, but there is a time alſo for dry, and a time for wet weather; and if theſe do not happen at proper ſeaſons, they will certainly happen at other ſeaſons: for not only the wiſdom of philoſophers hath diſcerned, but their experiments and obſervations hath put it out of doubt, that there is a certain rule or proportion obſerved between wet weather and dry in every country; ſo that it is nearly the ſame in every annual revolution; neither is it wet and dry weather only, but hot and cold, open and froſt, that are thus regulated; from whence we ſee, that when the ſcripture repreſents to us God's ſettling things by weight and meaſure, it ſpeaks not only elegantly, but exactly. For we do not mean by providence any extraordinary or ſupernatural interpoſition of almighty power, but the conſtant and ſettled order eſtabliſhed by the will of that almighty being, which we commonly call Nature.

There is nothing eaſier than for vulgar underſtandings to miſtake the meaning of words, and, by a ſuperſtition natural to weak minds, convert what they imperfectly underſtand into notions that perplex and confound them. Hence it proceeds, that, in common converſation, one hears people ſpeak of nature as of a being, or a kind of ſubordinate deity; whereas, in reality, the true meaning of nature is, that order or law which God has eſtabliſhed in the univerſe; and the knowledge of nature is no more than the light we acquire by ſtudy into the connexion of thoſe laws. In this ſenſe, experience is a kind of revelation, that is to ſay, it is a ſort of knowledge that comes to us from without, and is infallible in itſelf. We may indeed go on wrong, and deceive ourſelves in the arguments we raiſe from it; but the knowledge grounded upon experiments never varies.

This is ſufficient to ſhew us, how much wiſer a thing it is to truſt this ſort of experimental knowledge, than to put any faith in that kind of idle ſcience which amuſed our forefathers, and enabled almanack-makers to delude and miſlead them. It is true, we uſe the luminaries as well as they, but then we uſe them in a rational manner, and do not pretend to impoſe this or that ſign upon other people, but barely ſet down our own obſervations, which are to be examined and verified by the experience of thoſe to whom they are ſubmitted. The aſtrologer, on the other hand, inſiſts on what are not in nature; the twelve houſes are a mere invention, and ſo are all the properties aſcribed to the celeſtial ſigns, and to the planets; mere dreams and fictions deviſed by the cunning to cheat and impoſe upon the ignorant, and which had been long ago exploded, if people had brought them to the only teſt of which they are capable, I mean that of experience; with which they never did, never will, and indeed never can agree; whereas the rules given by our ſhepherd are ſuch as, we have ſhewn, ſuit perfectly well with the remarks of other ſtudious perſons in all ages.

XXVI. *If* October *and* November *be ſnow and froſt, then* Jannary *and* February *are like to be* open *and* mild.

AS this obſervation ſtands on the ſame foundation with the laſt, we need not dwell upon it particularly: and therefore, I ſhall proceed with my former reflexions. The only way to be acquainted with nature, is to ſtudy nature. All ſyſtems of human invention, that are not built upon experiments, are ſooner or later found to be falſe, becauſe, to ſay the truth, they are nothing better than ingenious contrivances invented by the wit of man, to conceal his ignorance. In order to account for what we behold, we muſt firſt of all take pains to be well acquainted with the fact, and not ſuffer ourſelves to be led away by opinion. In order to explain what I mean, I ſhall give an inſtance: All the world knows, that not only the vulgar, but the learned, were for many ages in a conſtant error about corruption, and really believed, that the heat of the ſun, and even animal heat produced worms, maggots, and other living creatures. Many grave writers carried the thing farther, and told us of rats, mice and other creatures, produced out of the ſlime of the river Nile, by the heat of the ſun in Egypt, which might very well paſs for truth among thoſe who fancied they ſaw every day ſomething of the like nature: I mean in the corruption of fleſh and other things, in which we behold thouſands of living creatures.

An Italian philoſopher deſtroyed this whole doctrine at once, by a ſimple and eaſy experiment. He expoſed a piece of raw fleſh in a glaſs-veſſel, well covered with gawz, to the air and ſun, and found that it putrified, without producing any living creatures. This ſhews how careful we ought to be with reſpect to facts; for, till this experiment was made, no body doubted that vermin were bred by, as well as in, putrified bodies; whereas we are now ſatisfied, that the heat of the ſun can no more produce a worm or a maggot, than a horſe or an elephant. By the ſame examination we might open the way to knowledge, by driving out a multitude of other errors: But the humour of taking things for granted, without enquiring into them, and then endeavouring to account for them by dint of reaſoning, amuſes us with a falſe ſhew of wiſdom, and encourages us to perſiſt obſtinately in the maintenance of weak and fooliſh notions.

To apply this to the ſubject of which we are treating, it is certainly a curious and an uſeful thing to underſtand the nature of the weather, and to know how the changes that happen in it come to paſs. The buſineſs is to find out the true way of coming at this kind of knowledge; and upon the principles that I have advanced, it is very evident, that the only certain way of coming at it, is by obſervation. This is a ſlow, but a ſure method of arriving at truth, and the ſpecimen here given us of one man's obſervations, is enough to convince us, that a little diligence and application would ſoon go a great way towards forming a body of ſuch obſervations, as might enable us to underſtand the weather thoroughly, and to predict its changes and alterations with a great degree of certainty. If we will not take this pains, we muſt content ourſelves with what hath been already diſcovered; or if our conditions of life exclude us from the opportunities of making ſuch obſervations, it is certainly a right thing to help ourſelves by enquiring into, and reaſoning upon ſuch obſervations as other people have made; and to facilitate this as far as poſſible, I have taken the pains to write this commentary upon our ſhepherd's rules, which, I hope, will render them more uſeful, or, at leaſt, ſecure them that regard which they deſerve.

There remains therefore nothing more for me to do, in order to recommend theſe obſervations, but to ſay ſomewhat with reſpect to the utility of the alterations of the weather in general, and in particular. In order to ſatisfy the reader, that there is nothing of chance or accident in ſuch alterations, but that they are governed in every reſpect by the ſame unerring wiſdom, that at firſt framed, and conſtantly preſerves the univerſe: all weathers are at ſometimes ſeaſonable, which ſhews that they are good in themſelves, and only accidentally evil. We ought not to meaſure things of a general nature by particular rules. If, by the direction of providence, the ſucceſſion of ſeaſons be ſuch, as that they turn to the good of mankind in the whole; it is no objection to, or diminution of providence, that this ſucceſſion of ſeaſons ſhould at different times be injurious to certain countries, becauſe this may likeways be accounted for.

As to particulars, we will begin with the air which is compoſed of exhalations of all earthly bodies, as well ſolid as fluid; as alſo of fire, whether of the ſun or the ſtars, or of earthly bodies burnt, or of fire breaking out from the entrails of the earth, and aſcending: and tho' it be thus compounded, and hath ſwiming in it multitudes of other things, yet we find that it is perfectly wholeſome, is the ſpring of motion and of life to men, and all other animals: ſo that tho' we cannot account for, and perhaps have not a power of comprehending, how ſuch a mixed body can be rendered ſalutary; yet ſince it is certain that ſo it is, we have no right to complain either of the evil conſequences that ſometimes attend the exhalations with which it is filled, or the accidents that flow from the frequent alterations that happen therein; becauſe theſe have a viſible tendency to the general good, and are apparently neceſſary to the preſervation of the univerſe; ſo that before we can have any title to find fault, we muſt firſt ſhew that we are capable of underſtanding them in their full extent, and as *this* is impoſſible, it follows *that* muſt be unreaſonable.

But this appears ſtill the more clearly, when it is conſidered, that all ſuch alterations may be ſhewn, even from the light of reaſon, to be generally uſeful, notwithſtanding they ſometimes appear troubleſome and noxious: For inſtance, ſuch quick ſtreams of air in motion as we call winds, though they ſometimes ſwell into ſtorms and tempeſts, yet are they of great benefit to mankind, by purging the air, and many other conveniencies. It is a proverb at Vienna, "that if Auſtria "be not windy, it is ſickly," and this ſaying is no leſs true in other countries; for, by conſulting the hiſtory of the laſt great plague that raged here in 1666, it will be found that there was in a manner a dead calm during the time of the ſickneſs; and it is known in Egypt, where they have plagues annually, that the change of the wind delivers them from that evil. Add to this the great uſe of winds in navigation, and reflect on the benefits that accrue therefrom, and we ſhall ſee no cauſe whatever to doubt, that this motion of the air is a very wiſe contrivance.

The condenſation of vapours, which is the cauſe o rain, is another great benefit to the world, in as much as this is very probably ſuppoſed to be the ſource o fountains, rivers, lakes, and other magazines of freſh water, without which the earth would be uninhabitable, and to which, in a very great meaſure, its fertility is owing. We ought likeways to remember, that tho' this be in itſelf ſo clear, and, at the ſame time, ſo certain, yet there are countries in the world where it very ſeldom rains, as in Egypt, and others where it hardly ever rains, as in Peru; ſo that we ſee there is no raiſing general doctrines upon this ſubject, which ought to make us the more tender in diſputing the will of providence, or repining when it happens to croſs our own.

The uſes of ſnow are as great, tho' leſs apparent, of which I ſhall mention but three, The *firſt* is, Its preſerving herbs and graſs in the winter againſt the ſeverity of froſt; *ſecondly*, Its ſupplying water to brooks and rivers; and, *laſtly*, Its furniſhing the earth with vaſt quantities of nitre, and thereby conducing greatly to its fertility; and perhaps the ſame thing may be ſaid of froſt, hard winters being often ſucceeded by luxuriant ſummers; and thus we find, that what, in appearance, cauſes ſcarcity, may, in reality, produce plenty.

Laſtly, Even thunder, however terrible in its appearance, and ſometimes fatal in its effects, is nevertheleſs very uſeful and beneficial upon the whole; for this likeways purifies the air from ſulphureous and oily exhalations, and the rains that fall with it fertilize the earth exceedingly: it alſo moderates the heat, as experience teaches us; for, as it is always gloomy and ſultry before thunder, ſo it is afterwards generally cool and pleaſant. Theſe remarks, tho' very ſhort, may give the reader an opportunity of extending his obſervations throughout all the variations of weather, and enable him to diſcern how uſeful and inſtructive a thing the ſtudy of its alterations may be, and how probable it is, that, by proper care and attention, we may arrive at a much more uſeful, as well as a much more certain knowledge in regard to the weather, than hitherto has been attained.

I ſhall conclude, by recommending to the reader's peruſal a very curious and entertaining letter, tho' written in a plain familiar ſtile, which will ſerve to exerciſe his thoughts, by affording him an opportunity of endeavouring to account, upon the principles before laid down, for the ſurpriſing varieties in that climate, which has been hitherto reputed the moſt irregular, and the moſt unwholſome in the world.

To Mr. W. D.

SIR,

I HAVE been very ill ſince my return home with the gout, ſo that I have not been capable of anſwering your expectation; but being a little better recovered, I ſhall make as good a return to your enquiry of the Harmatans on the coaſt of Guinea, as my circumſtances will permit. Their uſual time of blowing is between the latter part of December, and the beginning of February, before and beyond which ſeaſons they never exceed. They are of ſo very cold, ſharp, and piercing a nature, that the ſeams of the floors of our chambers, and the ſides and decks of our ſhips (as far as they are above water) will open ſo wide, as that, with facility, you may put a chalking-iron a conſiderable way into them; in which condition they continue ſo long as the Harmatan blows, which is ſometimes two or three, and very rarely five days, which is the very utmoſt I ever obſerved or heard of; and when they are gone they cloſe again, and are as tight as if it had never been. The natives themſelves, and all perſons that inhabit thoſe parts (during that ſhort ſeaſon) to prevent their pernicious effects, are obliged to confine themſelves within doors, where they endeavour their own ſecurity, by rendering their habitations as cloſe and impenetrable as poſſible: neither will they once ſtir abroad, unleſs induced thereto by a more than ordinary occaſion. It is as deſtructive to the cattle alſo, whoſe ſafeguard conſiſts in their proprietors care, who, againſt this ſeaſon, ought to provide ſome ſuch like place for them, otherways they muſt expect but a pitiful account when the ſeaſon is over; for it moſt certainly deſtroys them, and that in a very ſhort time.

This I accidentally experienced, by expoſing a couple of goats to the aſperity thereof, which, in four hours ſpace, or thereabouts, were deprived of life: Nay, we ourſelves (unleſs aſſiſted by the like conveniency, and the benefit of ſome ſweet oils to correct the air) cannot fetch our breath ſo freely as at other times, but are almoſt ſuffocated with too frequent and acid reſpirations. They generally blow between the Eaſt and Eaſt North-eaſt, to the Northward of which they never exceed, being the moſt ſettled and ſteady, but freſh gales, I ever obſerved; coming without thunder, lightning, or rain, but cloſe gloomy weather, the ſun not ſhining all the time: And when they expire, the trade-wind (which conſtantly blows on that coaſt at Weſt South-weſt and South-weſt) returns with the accuſtomary ſeaſonableneſs of weather.

The coaſt of Africa, from Cape Palmas to Cape Formoſa, lies Eaſt and Eaſt by North, and near thoſe points the land-breezes blow on that coaſt, which commonly begin about ſeven in the evening, and continue all night till near that time the next morning, during which interval, we are troubled with ſtinking fogs and miſts off ſhore, which, by the return of the ſea-breezes upon the oppoſite points, are all driven away, and we have the benefit of them in a curious freſh gale till about five in the afternoon.

And here let me note it for a general obſervation, that in thoſe and all other places within the tropics, (as far as ever I took notice) the wind is drawn by the land; for, if an iſland or head-land were inclining to a circular form, the ſea and land breezes fall in diametrically oppoſite to that part where you are: So that, if you are on the South-ſide, the ſea-breeze ſhall be at South, and the land-breeze, (when it comes in its ſeaſon) at North.

In getting on the coaſt, we endeavour to fall in with Cape Mount or Cape Miſerada, which is about eighteen leagues to the Eaſt South-Eaſtward thereof, and after that we double Cape Palmas, (whence, as aforeſaid, the land trends away Eaſt by North) the current near the ſhore ſets upon that point down into the bite. But in getting off, we attempt, as much as poſſible, to lay hold of St. Thomas, and thence to run to the Southward of the line, perhaps three or four degrees; for the further to the South we go, the ſtronger we find the gales, and more beneficial for getting off the African coaſt, but thoſe who keep to the Northward thereof, generally meet with more calms, and conſequently longer voyages enſue. In or about thoſe latitudes we continue, till we are got between twenty-five and thirty degrees to the Weſtward of Cape Lopez de Gonſalvo, and then we croſs again to go either for England or the Weſt-Indies. But, by the way, let me obſerve to you, that when once we are to the Weſtward of the Cape, and in South latitude, the current ſets Northerly, and the wind, to twenty degrees of latitude, is at Eaſt South-eaſt, as (to the like number of degrees) on the North-ſide of the line it blows at Eaſt North-eaſt; neither did I ever obſerve any mutation of the currents, unleſs in the Tornado-ſeaſon, when, during their blowing, they commonly ſet to windward, though perhaps the moon, upon full and change, may have the like influence there as in other places; but I never took any particular notice thereof.

The ſaid Tornadoes uſually come in the beginning of April, and ſeldom relinquiſh the gold-coaſt till July commences, and, with frequent viſits, make us ſenſible of their qualities. We have ſometimes three or four in a day; but then their continuance is but ſhort, perhaps not above two hours, and the ſtrength or fury of it may be about a quarter or half an hour, but accompanied with prodigious thunder, lightning and rain, and the violence of the wind ſo extraordinary, as that it has ſometimes rolled up the lead wherewith the houſes are covered, as cloſe and compactly as it poſſibly could be done by the art of man. The name implies a variety of winds; but the ſtrength of them is generally at South-eaſt, and, by ſhips that are bound off the coaſt, they are made uſe of to get to windward.

I ſhall conclude with that moſt worthy obſervation of the ſeaſon wherein the rains begin, which, on the Gold-coaſt, is about the 10th of April; and this may be generally remarked, from thirteen degrees North to fifteen South latitude, that they follow the ſun within five or ſix degrees, and ſo proceed with him till he has touched the tropic, and returns to the like ſtation again. This I ſhall illuſtrate by the following example; viz. Cape Corſo-caſtle lies in 4 d. 55 m. North. About the 10th of April, the ſun has near 12 d. North declination. At that time the rains begin and continue with the inhabitants of that place, until he has performed his courſe to the greateſt obliquity from off the equator, and returned to the like poſition South. The ſame I ſuppoſe may be obſerved and underſtood of other places within the tropics.

The variation (of which, in the year 1680, I made frequent obſervations) was 2 d. 14 m. Weſterly, and it generally flows at the aforeſaid place, South South-eaſt, and North North-weſt, upon the full and change, the water riſing upon Spring-tides about ſix or ſeven feet up and down.

I remain, Sir,

Your humble Servant,

J. G.

Thoſe cold winds, called Harmatans, are not at all more extraordinary than the burning winds on the coaſt of Perſia, which are terrible to the laſt degree, and in the months of June, July and Auguſt, render Gambroon the only port which the Perſians have on that ſide, uninhabitable. Theſe winds blow in a very narrow compaſs, and are viſible, and therefore avoidable, which is done by throwing one's ſelf flat on the ground till they are paſt over. If a man is on horſeback when he meets them, he muſt diſmount, and turn his horſe's tail to the wind, and then, lying down by him, he preſerves the beaſt's life and his own.

There was, in the year 1712, a very ſingular inſtance of the malignity of theſe winds. Two French gentlemen would needs travel, in the month of July, from Gambroon to Iſpahan, notwithſtanding all that the chief of the Engliſh factory could ſay to diſſuade them, believing probably, that what he told them was only the fables of the country, for which they paid dearly. The general rule for travellers is, to ſet out between three and four in the morning, and travel till nine, which rule theſe French gentlemen obſerved; and, being fatigued by their morning's journey, as ſoon as they came to a caravanſary (which are lodgings built at every ſtage's end, a ſtage being about fifteen miles) they were diſpoſed to reſt, and ordered their ſervants to make their beds ready, (for even thoſe neceſſary furniture travellers are obliged to carry along with them on carriage-beaſts) directing them to call them when dinner was ready, and withall ordered a ſheet for each of them to be dipped in water, to lay over them to cool them. One of theſe hot blaſts unfortunately came whilſt the gentlemen ſlept, and had left the windows of the room open, and the wind blowing in at the windows, ſcorched them both to death on their beds, where the ſervants found them when dinner was ready, and, pulling off the ſheets, the ſkin, and ſome fleſh, came off with them.

It is certainly a great happineſs to our country, that we have none of thoſe dreadful winds: but this however need not reſtrain us from endeavouring to diſcover their cauſes, and the manner of their extraordinary operations, which might perhaps be of uſe in accounting for damps in mines and other places, which induced me to give them a place here, as matters that could not be unacceptable to the curious.

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